

REMARKS/ARGUMENTS

I. Concerning the Amendments

Claims 4 and 34 are amended herein to incorporate the content of Claims 13 and 24. Claims 13 and 24 are cancelled in view of the amendments to Claims 4 and 34. These amendments specify preferred coating conditions in response to the rejection under 35 U.S.C. 112.

II. Concerning the Provisional Double Patenting Rejection

Applicants elect to defer treatment of this provisional rejection over copending application ser. no. 10/257,172 (attorney docket no. 61590A) until such time as Examiner identifies allowable subject matter in this application.

III. Concerning the Rejection under 35 U.S.C. 112

Various claims stand rejected under the first paragraph of 35 U.S.C. 112 as allegedly being based on a disclosure which is not enabling. Examiner argues that essential conditions are missing from the claims, citing Applicants' description of JP-A-10-328613 in Applicants' specification at p. 6, lines 21-28.

The specification at p. 7, lines 16-29, contains a statement of the invention that is commensurate in scope with Claims 4 and 34, the pending independent claims. These claims specify, using the terms of those claims, that at least one layer of the curtain have shear-thickening behavior. JP-A-10-328613, while disclosing a non-Newtonian coating fluid, does not disclose coating with a shear-thickening composition. See, for example, Drawing 2 of the JP reference, which clearly shows a shear-*thinning* composition. The ratio of the viscosity at $30,000\text{ s}^{-1}$ to the viscosity at $3,000\text{ s}^{-1}$ at 25°C , shown in that drawing is less than 1, and thus is not at least about 1.2 as specified in Applicants' Claim 4.

In the spirit of cooperation, amendments to Claims 4 and 34 are presented to indicate web velocity and solids content. In view of the amendments and preceding arguments, reconsideration and withdrawal of the rejection under the first paragraph of 35 U.S.C. 112 is respectfully requested.

IV. Concerning the Rejection over Prior Art

The invention is directed to a process of producing a coated paper or paperboard, other than photographic papers, using coating compositions containing pigments that do not produce suitable coatings on blade type, bar or rod type, or reverse-roll type paper coating machines. Two independent claims are pending in the application.

Claim 4 is directed to coating with shear-thickening materials, and includes the phrase "whereby a composition forming at least one layer of the free flowing curtain has a Shear-Thickening Index, defined as the ratio of the viscosity at $30,000\text{ s}^{-1}$ to the viscosity at $3,000\text{ s}^{-1}$ at 25°C , of at least about 1.2" and relates to the use of a curtain having a Shear-Thickening Index of at least about 1.2.

Claim 34 includes the phrase "whereby a composition forming at least one layer of the free flowing curtain has a Shear-Blocking Behavior." Shear-Blocking Behavior is defined in the specification at the bottom of page 7, and can be viewed as resulting from using a material that exhibits an extreme form of shear-thickening.

Applicants submit that the paper and paperboard coating processes of the prior art did not employ such coating compositions in view of the difficulty of producing acceptable coatings with such compositions.

A. The Rejection over JP-A-10-328613

Various claims stand rejected under 35 USC 102 over JP-A-10-328613 (hereinafter Kashiwada).

Claims 4 and 34 are novel over Kashiwada for the reasons stated above in connection with the rejection under 35 U.S.C. 112, namely, Kashiwada does not disclose coating with a shear-thickening composition.

B. Hirabayashi-Based Rejections

Various claims stand rejected under 35 USC 103(a) as being unpatentable over Hirabayashi et al. (US 5,789,031, hereinafter Hirabayashi '031) in view of Clarke et al. (US 6,099,913, hereinafter Clarke) or Suga et al. (US 5,393,571, hereinafter Suga).

Claims 27-28 stand rejected under 35 USC 103(a) over Hirabayashi in view of Suga or Clarke, and further in view of Mitani et al. (US Patent 5,773,093, hereinafter Mitani). Mitani discloses a “catch pan” device to be used in the start up and shut down of a curtain coater. Regarding the coating composition, Mitani, at col. 7, line 20, gives no more detail than to refer to a “coating liquid prepared in advance.”

Claims 2-19, 22-25, 29-32 and 36-37 stand rejected under 35 USC 103(a) as being unpatentable over Hirabayashi et al. (US 6,458,413, hereinafter Hirabayashi '413) in view of Clarke or Suga.

Unless otherwise indicated, Applicants at the present time elect to address the patentability of the independent claims, and for the purposes of this response the patentability of the dependent claims stands or falls together with the patentability of their relevant independent claim.

The invention of the Hirabayashi '031 reference is directed to a post-treatment step, and is not concerned with how the “normal” coating process is conducted, since the normal coating process is merely a precursor to the process of Hirabayashi '031. The Hirabayashi '031 reference contains a boilerplate paragraph referring to known techniques for applying aqueous pigmented coating compositions to base paper. However, there is no appreciation of the subject matter of Applicants' claims in Hirabayashi '031.

Hirabayashi '413 is directed to making a coated paper wherein the manufacturing process includes a pretreating step wherein an aqueous solution of polyvinyl alcohol is applied and dried to form a base paper. The purpose of the polyvinyl alcohol precoating is to increase the air resistance of the base paper. The Hirabayashi '413 reference teaches that the resulting pretreated base paper can be subsequently coated using conventional coating techniques.

In view of the fact that Hirabayashi '413 contains the same or essentially the same boilerplate language regarding coating processes and pigments as the boilerplate language of the Hirabayashi '031 reference, the two Hirabayashi references are viewed as being cumulative in nature and Applicants will address the two rejections as one.

Examiner's rationale appears to relate to the viscosity limitations of Claim 1, which was previously cancelled. That rationale is no longer applicable in view of the cancellation of Claim 1.

Claim 4 specifies that a composition forming at least one layer of the free flowing curtain has a Shear-Thickening Index of at least 1.2. The Hirabayashi references do not discuss viscosity. However, the record contains a declaration of Dr. Michael J. Devon indicating that the Shear-Thickening Index of the coating composition of Hirabayashi '031 Embodiment 1 was 0.577, which is far less than the value of 1.2 specified by Applicants' Claim 4. Clarke does not show any shear-thickening compositions, in other words, the Shear-Thickening Index of the compositions of Clarke are less than 1. This is clearly seen in Figure 5 of Clarke, which shows that for three compositions the viscosity at $30,000 \text{ s}^{-1}$ is lower than the viscosity at $3,000 \text{ s}^{-1}$, i.e. the Shear-Thickening Index is less than 1 for those compositions. Specifically, for curve (a) of Clarke's Figure 5, the Shear-Thickening Index is approximately $40/60$, or 0.67. Regarding Suga, the teaching of Suga is summarized in Clarke at column 3. Clark states as follows at column 3, lines 29-34: "Suga et al. teach increasing the viscosities of coating compositions for the purposes of their method by the addition of a thickening agent that interacts with the binder in the composition, i.e. gelatin, to increase the viscosity at low shear rate without substantially increasing its viscosity at high shear rate" It is clear from this passage of Clarke that Suga does not disclose coating compositions having a Shear-Thickening Index of greater than 1.2, because it teaches that the viscosity at low shear is higher than the viscosity at high shear, i.e. that Suga uses a *shear-thinning* composition. Accordingly, Applicants submit that the subject matter of Claim 4 is not obvious, and request reconsideration of this rejection.

Claim 34 includes the phrase "whereby a composition forming at least one layer of the free flowing curtain has a Shear-Blocking Behavior." As mentioned in the specification at the bottom of page 7, Shear-Blocking Behavior is determined by observing an increase in viscosity of greater than about 100% over less than a tenfold increase in shear rate, where the viscosity values are measured using the Parallel Plate Viscosity Test defined in the specification. No coating composition with this

behavior is identified in Hirabayashi, Clarke or Suga for the reasons given above in connection with Claim 4. Rather, the prior art compositions exhibit a decrease in viscosity with increasing shear rate as shown in Clarke Figure 5. Stated another way, Hirabayashi, Clarke and Suga are dealing with shear-thinning compositions, whereas Shear-Blocking Behavior is an extreme form of shear-thickening.

C. The Yokota-Based Rejection

Various claims stand rejected under 35 USC 103(a) as being obvious over Yokota in view of Kustermann (U.S. Patent 6,146,690), Suga or Clarke, with or without Mitani.

Yokota teaches a reactive coating process conducted using a relatively low solids curtain. The problem addressed by Yokota is poor layer purity due to intermingling of layer components caused by water transport phenomena in low solids coatings in the direction of the base paper, i.e. the base paper absorbs water. Yokota's solutions to limit water transport towards the base paper were as follows: (1) to use an isolating layer between two curtain layers that increase in viscosity when contacted with each other; (2) to use 2 adjacent layers that increase in viscosity over time when brought into contact with each other or mixed; (3) to precoat the substrate with water; or (4) to apply an interface layer of at least 90% water between the base paper and the other layers of the curtain. At column 2, lines 38-64 Yokota explains that photographic coatings contain gelatin, and that said coatings are cooled immediately upon coating to set the coating so that no intermingling of the coating layers possible. He further explains that for his applications gelatin causes problems, as it degrades various properties of his coating materials. He also explains that, unlike photosensitive materials, most of his materials use a substrate that readily absorbs water. At column 5, lines 52-3, he explains that intermingling of layers results in unsatisfactory products. At column 6, lines 6-10 he teaches that his process prevents intermingling of layers.

Yokota does not disclose any coating composition exhibiting Shear-Blocking Behavior or a Shear-Thickening Index of at least about 1.2.

Examiner cites Mitani and Kustermann, and possibly Yokota, for the proposition that any material can be successfully applied using a curtain coater. However, that proposition is clearly rebutted by Clarke and Suga. Both Clarke and Suga go into great detail regarding successful coating regions or "coating windows." As such, they must be given more weight than the machine-oriented references Mitani and Kustermann. Both Mitani and Kustermann merely contain broad, generic statements regarding coating conditions because both of these references are directed to mechanical accessories to a curtain coating apparatus and are not concerned with coating compositions. Accordingly, Applicants respectfully submit that any combination of Yokota, Clarke, Suga, Mitani and Kustermann does not render any of the pending claims obvious.

Clarke and Suga indicate that the curtain coating process is a complex combination of chemical and mechanical components involving a nearly limitless combination of possibilities, and a wide variety of parameters that can be varied. Thus, Applicants' claimed invention is unlike the one in *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (US S.Ct. 2007), which involved a simple mechanical invention. Applicants respectfully submit that the claims contained in the present application are not obvious over the prior art, which neither teaches nor suggests their subject matter.

VII. Conclusion

For the foregoing reasons, reconsideration of the claims and passing of the application to allowance are solicited.

Respectfully submitted,

/Paul_D._Hayhurst/_Reg_No._30180
Paul D. Hayhurst
Registration No. 30,180
Phone: 989-636-9373

P. O. Box 1967
Midland, MI 48641-1967

PDH/sk